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TRANSLATION

EFFECTIVE MEANS OF COMBATTING METAL CORROSION

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Effective Means of Combatting Metal Corrosion

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M. Trifel'

At the thematic fair, organized by VDNKH USSR, were widely displayed and reflected modern means of combatting metal corrosion. The experience, gathered at chemical industry, at sea shore Petroleum Industries, in R/R transportation and in other branches of national economy, can easily be applied to maritime organizations. Particularly. good result in combatting corrosion are obtained: through the employment of new coatings prepared on the basis of synthetic polymers; physico-chemical methods of protecting metal, which comes in contact with sea water; alloys possessing higher corrosion resistance; new types of inhibiting reagents; highly productive mechanisms and measuring instruments to control the state and technology of applying coatings; protection with corrosion resistant metal coatings, and electrochemical protection as well.

Of greater interest for sea transportation are paints and enamels, prepared on epoxy resin base and ethinol lacquers. This product can be used for protecting the body in below and above water parts of the ships. Such coatings have high adhesion to metal and resistance to sea water and tropical climate. Highly recommended are phenolformaldehyde paints AISH, displayed by the Gipromorneft Inst. They can be applied on wet surface, can be used for painting bilges and other parts of the body, where greater constant moisture exists.

Paste YAN-7A, having high stability, can find broad application. The paste is applied on a cleaned surface in melted state. During rapid desiccation is formed a nonporous strong film (layer). Good evaluation was obtained by the anticorrosion

coating, developed by TSNIIMF on epoxy resin base and reinforced with glass fiber. This coating possesses mechanical, chemical and electric stability and adhesion and can be used for protecting anodes of cathodic installations, ship propellers and propeller shafts. High stability is also possessed by a composition by nitrile rubber and VDU resin ("Klastomer") used in protecting underwater parts of ships on underwater wings. Many Plastic exponents have been displayed. They can be used for the manufacture of individual ship components (pipe lines, pumps, propellers etc.) and entire ship bodies as well. The use of plastic elements, possessing high stability to sea water, allows to expand the problem of protecting same against corrosion.

Greater corrosion stability and heat conductivity has been displayed by compositions made of plastics and graphite powder. Graphoplastic tubes can successfully replace tubes made of nonferrous metals and used in refrigerators. Thermal insulation can be made from staple glass fiber, glued on top with resins.

The fair generalized a method of combatting corrosion with the aid of electro chemical methods, developed by scientific-research inst, especially by the Giprometneft' and TSNIIMF. The principles of such protection consist in the formation of films from calcium and magnesium salts, deposited from sea water on the cathode polarized surface of the metal.

To protect water and ballast tanks on Donbassvodtrest ships of the Stalinsk Sovnarkhoz was developed a method for the deposition of lime layers. Per liter of water into the puryfing tank are introduced 5-20 mg of CaO. Lime deposits rapidly on the metal. Experiments showed that it is sufficient to process the water in this manner for a period of 45-50 diurnal periods and on the walls of the tank is formed a 1-2 mm thick lime layer, capable for a period of 2-3 years to protect the metal against corrosion.

The fair has widely advertised various methods of increasing the stability of anodic systems by employing anode stable materials (graphite, ferrosilide, plati-

num coated titanium anodes and many others). These materials possess greater anodic stability and allow for a sharp reduction in the dimensions of anodes, to simplify their construction and increase the service life.

Of interest are special instruments (tools) for measuring currents and potentials of structures, protected by electrochemical installations. Displayed were comparison electrodes, high ohmic electromagnetic and cathodic voltmeters.

Very important for the fleet (navy-maritime) are recommendadtions on how to combat stray currents, originating during the repair and adjustment of ships in dry dock as result of incorrect arrangement and installation of welding units. There was a case, when on such ships were detected signs of bodily decays (and in ships adjacent to them) as result of migration of stray currents.

Interesting investigations on the obtainment of new types of steel, containing titanium and possessing exclusively high corrosion resistance in sea water and high heat resistance. Titanium pipes have appeared intended for ultra high pressure boilers. These pipes are lined from outside and inside with plastics and glass.

A considerable effect can be attained by using low-alloyed steel, having small admixtures of chromium, nickel and copper. This kind of steel has under atmospheric conditions a doubly greater corrosion resistance and simultaneously a considerably greater mechanical strength. But when using same consideration must be given to the durable and good adhesion of scalings with basic metal. Such scale cannot be removed by hand and as result are formed vapors between the sections of the metal with damaged and undamaged scale, which leads to rapid development of local corrosion damages. This phenomenon is very intensively pronounced on the below water level parts of ships body. Consequently special attention should be devoted to cleaning low alloyed ship elements from scale. At the fair were widely exhibited various contrivances for descaling and derusting metal, as well as new methods for preparing metal surfaces for application of lacquer coatings.

New methods have been demonstrated for protecting metals by conserving same with

inhibitors. Inhibitors produce on the surface of the metal thin films of adsorbed particles, capable of preventing for a long period of time metal corrosion under the most unfavorable conditions. Higher protection can be attained by introducing inhibitors (calcium sulfonate, oxidized petrolatum etc) into the composition of greases. Inhibitors can be introduced into the composition of an electrolyte or corrosion medium (sodium hexametaphosphorate etc.). There is also a method of introducing volatile inhibitors (NDA, trietapolaminnitrile etc) into corrosion dangerous atmosphere. By using such different methods it is possible to attain excellent preservability of tankers and reservoirs, in which are transported also sulfurous petroleum products, acids. The use of inhibitors in maritime service will enable to obtain greater economy.

One of the basic ways of combatting corrosion of ship mechanisms and ship equipment is wide employment of nonferrous metals (bronze, brass). The consumption of these metals could be reduced considerably, on one hand, by expanding the employment of plastic components and units, and on the other hand, by using steel components, protected with stable metal coatings. Of special interest is thermodiffusion zinc plating, allowing to obtain a strong protective coating, capable for a long time to resist the action of atmospheric sea conditions. This coating has high electrical conductivity and greater mechanical adhesion strength. Thermo diffusion zinc plated details can in many instances replace objects made from nonferrous alloys.

The Giprocmorneft' Inst. developed methods of applying cathodic and protective installations, with the aid of which it is possible to reliably protect under water pipe lines, groovings and metallic poles of individual bases and scaffold poles. The very same methods can be used for protecting signal signs and floating beacons.

Special attention should be devoted to protection of poles in the zone of variable wetting by waves and influc phenomena above the water-air boundary. For a zone where rates of corrosion reach very great values (up to 1 mm per annum), and the corrosion itself is of uniform nature, are recommended paint coatings AISH, reinforced

with hydrocarbon indelible grease. For newly built constructions it is possible to use thermo diffusion coatings or rubberized to a height of 2-3 meters from the water-air boundary.

When possible elements of these constructions should be removed from the danger zone or placed below water level where they can be easily protected by a cathodic installation, or above the water, where corrosion conditions are less destructive. To protect upper structures of hydrotechnical installations it is possible to use three-four layer lacquer coatings, applied on a cleaned and phosphated surface. In the role of material for such coatings is recommended "cold bitumen"- solution of a mixture of Rubrex with petrolatum in a wide xylene fraction. This material has greater frost resistance and adheres to the metal at relatively air humidity.

The fair " Means of Combatting Corrosion of Metals " brought in rich experience, the application of which will enable to extend the service life of ships and harbor installations, considerably reduce the expenditures connected with operation of sea fleet.

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